

WHAT IS CLAIMED IS:

Sub B12

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1. A device having at least one liquid crystal panel, said liquid crystal panel comprising:

a first substrate having an insulating surface;

a second substrate being opposed to the first substrate;

at least one thin film transistor being formed over the first substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

wherein the channel region, the source and drain region of said one thin film transistor is formed in a crystalline semiconductor island;

an organic resin film formed over said first substrate to provide a leveled upper surface over said first substrate, said organic resin film covering said thin film transistor;

a pixel electrode formed on said leveled upper surface, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film;

a liquid crystal material having ferroelectricity or anti-ferroelectricity and being formed between the first substrate and the second substrate.

2. A device according to claim 1, wherein said organic resin film comprises polyimide.

3. A device according to claim 1, wherein said pixel electrode is transparent.

4. A device according to claim 1, wherein said thin film transistor is a top-gate type in which said gate electrode is located above said channel region.

5. A device having at least one liquid crystal panel, said liquid crystal panel comprising:

a first substrate having an insulating surface;

a second substrate being opposed to the first substrate;

at least one thin film transistor being formed over the first substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

wherein the channel region, the source and drain region of said one thin film transistor is formed in a crystalline semiconductor island;

an organic resin film formed over said first substrate to provide a leveled upper surface over said first substrate, said organic resin film covering said thin film transistor;

a pixel electrode formed on said leveled upper surface, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film;

a liquid crystal material having ferroelectricity or anti-ferroelectricity and being formed between the first substrate and the second substrate,

wherein said channel region comprises crystal silicon and exhibits a peak of Raman spectra displaced from 522 cm⁻¹ to the low frequency direction.

5 6. A device according to claim 5, wherein said organic resin film comprises polyimide.

7. A device according to claim 5, wherein said pixel electrode is transparent.

10 8. A device according to claim 5, wherein said thin film transistor is a top-gate type in which said gate electrode is located above said channel region.

15 9. A device having at least one liquid crystal panel, said liquid crystal panel comprising:
a first substrate having an insulating surface;
a second substrate being opposed to the first substrate;
at least one thin film transistor being formed over the first substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;
20 wherein the channel region, the source and drain region of said one thin film transistor is formed in a crystalline semiconductor island;
an organic resin film formed over said first substrate to provide a leveled upper surface over said first substrate, said organic resin film covering said thin film transistor;

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a pixel electrode formed on said leveled upper surface, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film;

5 a liquid crystal material having ferroelectricity or anti-ferroelectricity and being formed between the first substrate and the second substrate;

10 a leveling film being formed over said second substrate;
an opposed electrode formed over said leveling film and opposed to said pixel electrode with said liquid crystal material interposed therebetween.

10. A device according to claim 9, wherein said organic resin film comprises polyimide.

11. A device according to claim 9, wherein said pixel electrode is transparent.

15 12. A device according to claim 9, wherein said thin film transistor is a top-gate type in which said gate electrode is located above said channel region.

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20 13. A television comprising:
a tuner for receiving television radio wave;
a liquid crystal panel operationally connected to said tuner,
said liquid crystal panel comprising:

a first substrate having an insulating surface;
a second substrate being opposed to the first substrate;

5 at least one thin film transistor being formed over the first substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

wherein the channel region, the source and drain region of said one thin film transistor is formed in a crystalline semiconductor island;

10 an organic resin film formed over said first substrate to provide a leveled upper surface over said first substrate, said organic resin film covering said thin film transistor;

15 a pixel electrode formed on said leveled upper surface, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film;

a liquid crystal material having ferroelectricity or anti-ferroelectricity and being formed between the first substrate and the second substrate.

20 14. A television according to claim 13, wherein said organic resin film comprises polyimide.

15. A television according to claim 13, wherein said pixel electrode is transparent.

25 16. A television according to claim 13, wherein said thin film transistor is a top-gate type in which said gate electrode is located above said channel region.

0 17. A television comprising:

a tuner for receiving television radio wave;

a liquid crystal panel operationally connected to said tuner,
said liquid crystal panel comprising:

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a first substrate having an insulating surface;

a second substrate being opposed to the first substrate;

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at least one thin film transistor being formed over the
first substrate, said thin film transistor including at least a channel region,
source and drain regions with said channel region therebetween, a gate
insulating film adjacent to said channel region and a gate electrode adjacent
to said channel region with said gate insulating film interposed
therebetween;

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wherein the channel region, the source and drain region
of said one thin film transistor is formed in a crystalline semiconductor
island;

an organic resin film formed over said first substrate
to provide a leveled upper surface over said first substrate, said organic
resin film covering said thin film transistor;

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a pixel electrode formed on said leveled upper surface,
said pixel electrode being electrically connected to said thin film transistor
through an opening formed in said organic resin film;

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a liquid crystal material having ferroelectricity or anti-
ferroelectricity and being formed between the first substrate and the second
substrate,

wherein said channel region comprises crystal silicon and
exhibits a peak of Raman spectra displaced from 522 cm⁻¹ to the low
frequency direction.

18. A television according to claim 17, wherein said organic resin film comprises polyimide.

19. A television according to claim 17, wherein said pixel electrode is transparent.

5 20. A television according to claim 17, wherein said thin film transistor is a top-gate type in which said gate electrode is located above said channel region.

Sub B4 Y 10 21. A television comprising:
a tuner for receiving television radio wave;
a liquid crystal panel operationally connected to said tuner,
said liquid crystal panel comprising:

15 a first substrate having an insulating surface;
a second substrate being opposed to the first substrate;
at least one thin film transistor being formed over the
first substrate, said thin film transistor including at least a channel region,
source and drain regions with said channel region therebetween, a gate
insulating film adjacent to said channel region and a gate electrode adjacent
to said channel region with said gate insulating film interposed
therebetween;

20 wherein the channel region, the source and drain region
of said one thin film transistor is formed in a crystalline semiconductor
island;

25 an organic resin film formed over said first substrate
to provide a leveled upper surface over said first substrate, said organic
resin film covering said thin film transistor;

a pixel electrode formed on said leveled upper surface,
said pixel electrode being electrically connected to said thin film transistor
through an opening formed in said organic resin film;

a liquid crystal material having ferroelectricity or anti-
ferroelectricity and being formed between the first substrate and the second
substrate;

a leveling film being formed over said second substrate;
an opposed electrode formed over said leveling film
and opposed to said pixel electrode with said liquid crystal material
interposed therebetween.

22. A television according to claim 21, wherein said organic resin
film comprises polyimide.

23. A television according to claim 21, wherein said pixel
electrode is transparent.

24. A television according to claim 21, wherein said thin film
transistor is a top-gate type in which said gate electrode is located above
said channel region.

25. A portable computer having a liquid crystal panel, said liquid
crystal panel comprising:

a first substrate having an insulating surface;

a second substrate being opposed to the first substrate;

at least one thin film transistor being formed over the first
substrate, said thin film transistor including at least a channel region, source
and drain regions with said channel region therebetween, a gate insulating

film adjacent to said channel region and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

wherein the channel region, the source and drain region of said one thin film transistor is formed in a crystalline semiconductor island;

5 an organic resin film formed over said first substrate to provide a leveled upper surface over said first substrate, said organic resin film covering said thin film transistor;

a pixel electrode formed on said leveled upper surface, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film;

a liquid crystal material having ferroelectricity or anti-ferroelectricity and being formed between the first substrate and the second substrate.

15 26. A portable computer according to claim 25, wherein said organic resin film comprises polyimide.

27. A portable computer according to claim 25, wherein said pixel electrode is transparent.

20 28. A portable computer according to claim 25, wherein said thin film transistor is a top-gate type in which said gate electrode is located above said channel region.

29. A portable computer having a liquid crystal panel, said liquid crystal panel comprising:

a first substrate having an insulating surface;

a second substrate being opposed to the first substrate;

at least one thin film transistor being formed over the first substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

wherein the channel region, the source and drain region of said one thin film transistor is formed in a crystalline semiconductor island;

an organic resin film formed over said first substrate to provide a leveled upper surface over said first substrate, said organic resin film covering said thin film transistor;

a pixel electrode formed on said leveled upper surface, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film;

a liquid crystal material having ferroelectricity or anti-ferroelectricity and being formed between the first substrate and the second substrate,

wherein said channel region comprises crystal silicon and exhibits a peak of Raman spectra displaced from 522 cm⁻¹ to the low frequency direction.

30. A portable computer according to claim 29, wherein said organic resin film comprises polyimide.

31. A portable computer according to claim 29, wherein said pixel electrode is transparent.

32. A portable computer according to claim 29, wherein said thin film transistor is a top-gate type in which said gate electrode is located above said channel region.

Sub B6 5 33. A portable computer having a liquid crystal panel, said liquid crystal panel comprising:

a first substrate having an insulating surface;

a second substrate being opposed to the first substrate;

at least one thin film transistor being formed over the first substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

wherein the channel region, the source and drain region of said one thin film transistor is formed in a crystalline semiconductor island;

an organic resin film formed over said first substrate to provide a leveled upper surface over said first substrate, said organic resin film covering said thin film transistor;

a pixel electrode formed on said leveled upper surface, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film;

a liquid crystal material having ferroelectricity or anti-ferroelectricity and being formed between the first substrate and the second substrate;

a leveling film being formed over said second substrate;

an opposed electrode formed over said leveling film and opposed to said pixel electrode with said liquid crystal material interposed therebetween.

34. A portable computer according to claim 33, wherein said organic resin film comprises polyimide.

35. A portable computer according to claim 33, wherein said pixel electrode is transparent.

5 36. A portable computer according to claim 33, wherein said thin film transistor is a top-gate type in which said gate electrode is located above said channel region.

37. A projector comprising:
a light source;
at least one liquid crystal panel to modify the light from said light source;

at least one lens for projecting the light modified by said one liquid crystal panel onto a screen, wherein said liquid crystal panel comprises:

15 a first substrate having an insulating surface;
a second substrate being opposed to the first substrate;
at least one thin film transistor being formed over the first substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

20 wherein the channel region, the source and drain region of said one thin film transistor is formed in a crystalline semiconductor island;

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an organic resin film formed over said first substrate to provide a leveled upper surface over said first substrate, said organic resin film covering said thin film transistor;

a pixel electrode formed on said leveled upper surface, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film;

a liquid crystal material having ferroelectricity or anti-ferroelectricity and being formed between the first substrate and the second substrate.

10 38. A projector according to claim 37, wherein said organic resin film comprises polyimide.

39. A projector according to claim 37, wherein said pixel electrode is transparent.

15 40. A projector according to claim 37, wherein said thin film transistor is a top-gate type in which said gate electrode is located above said channel region.

20 41. A projector comprising:
a light source;
at least one liquid crystal panel to modify the light from said light source;
at least one lens for projecting the light modified by said one liquid crystal panel onto a screen, wherein said liquid crystal panel comprises:

a first substrate having an insulating surface;

a second substrate being opposed to the first substrate;
at least one thin film transistor being formed over the
first substrate, said thin film transistor including at least a channel region,
source and drain regions with said channel region therebetween, a gate
5 insulating film adjacent to said channel region and a gate electrode adjacent
to said channel region with said gate insulating film interposed
therebetween;

wherein the channel region, the source and drain region
of said one thin film transistor is formed in a crystalline semiconductor
10 island;

an organic resin film formed over said first substrate
to provide a leveled upper surface over said first substrate, said organic
resin film covering said thin film transistor;

a pixel electrode formed on said leveled upper surface,
15 said pixel electrode being electrically connected to said thin film transistor
through an opening formed in said organic resin film;

a liquid crystal material having ferroelectricity or anti-
ferroelectricity and being formed between the first substrate and the second
substrate,

20 wherein said channel region comprises crystal silicon and
exhibits a peak of Raman spectra displaced from 522 cm⁻¹ to the low
frequency direction.

42. A projector according to claim 41, wherein said organic resin
film comprises polyimide.

25 43. A projector according to claim 41, wherein said pixel
electrode is transparent.

44. A projector according to claim 41, wherein said thin film transistor is a top-gate type in which said gate electrode is located above said channel region.

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45. A projector comprising:
a light source;
at least one liquid crystal panel to modify the light from said light source;

at least one lens for projecting the light modified by said one liquid crystal panel onto a screen, wherein said liquid crystal panel comprises:

a first substrate having an insulating surface;

a second substrate being opposed to the first substrate;

at least one thin film transistor being formed over the first substrate, said thin film transistor including at least a channel region, source and drain regions with said channel region therebetween, a gate insulating film adjacent to said channel region and a gate electrode adjacent to said channel region with said gate insulating film interposed therebetween;

wherein the channel region, the source and drain region of said one thin film transistor is formed in a crystalline semiconductor island;

an organic resin film formed over said first substrate to provide a leveled upper surface over said first substrate, said organic resin film covering said thin film transistor;

a pixel electrode formed on said leveled upper surface, said pixel electrode being electrically connected to said thin film transistor through an opening formed in said organic resin film;

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a liquid crystal material having ferroelectricity or anti-ferroelectricity and being formed between the first substrate and the second substrate;

a leveling film being formed over said second substrate;
an opposed electrode formed over said leveling film
and opposed to said pixel electrode with said liquid crystal material interposed therebetween.

46. A projector according to claim 45, wherein said organic resin film comprises polyimide.

10 47. A projector according to claim 45, wherein said pixel electrode is transparent.

48. A projector according to claim 45, wherein said thin film transistor is a top-gate type in which said gate electrode is located above said channel region.

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